AMSAT NEWSLETTER

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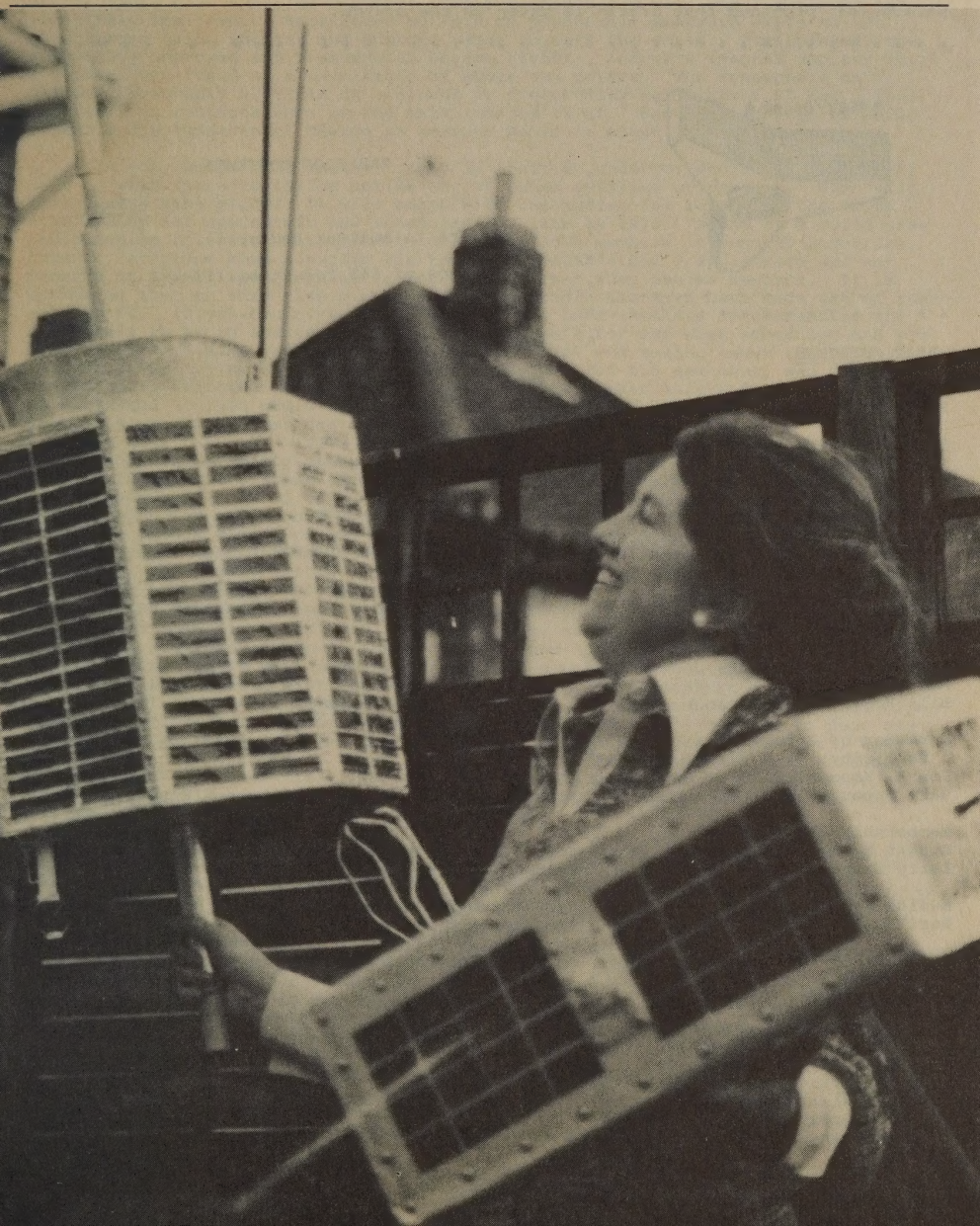

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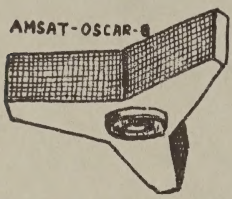

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COVER PICTURE

Norma, wife of G3IOR, symbolically demonstrating her support of Pat (G3IOR) and the AMSAT-OSCAR program.

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WANTED

MODE B SSB BULLETIN STATIONS

Volunteers for Mode B SSB Bulletin Stations are needed. If you are willing to give one bulletin a week on the day of your choice, contact Vic Politi, W1NU, AMSAT Bulletin Manager, 69 Flax Road, Fairfield, Connecticut, 06430, telephone (203) 259-4655, for more information.

EDITORIAL

A NEW ERA IN AMATEUR RADIO

BY JOE KASSER, G3ZCZ

Amateur Radio is about to undergo a fundamental change. About fifty years ago amateur radio as it was then was revolutionized by the discovery that the hf bands could support long distance communications. For at that time amateurs were limited to working their friends across town or the occassional dx station using high powers and long wire antennas on the long wave bands. With the introduction of the short wave bands dx contacts became common place with small antennas and relatively low power. Encouraged by this dx potential, amateurs explored the short waves using shorter and shorter waves to work the world. Time passed, the technology improved and frequencies became higher: and wave lengths shorter until a barrier was found at a wavelength of about ten meters. The ionosphere only allowed reasonably reliable dx contacts at frequencies below about 30 MHz. Thus for years dx contacts were in the main limited to hf. Now that barrier is being broken and a fundamental change in Amateur Radio is about to take place.

In the change that amateur radio is about to undergo, whole new bands will open up with characteristics unlike any of those existing at present. When will that change take place? It will begin with the successful launch of the first AMSAT-PHASE III spacecraft now scheduled for late in 1979. AMSAT is a world wide organization of radio amateurs with more than 3000 members in over 85 countries. However, everyone communicating via the AMSAT-OSCAR 6 and 7 spacecraft are not members of AMSAT, and there is no requirement that they become members. It is estimated that at this time many thousands of radio amateurs have made use of these spacecraft. If you count the amateurs who have been involved in commanding the spacecraft so as to ensure that they are available for use when scheduled and you count those amateurs involved in publicizing AMSAT and making known the capabilities of the existing satellites and the potentials of the new ones, and you count the amateurs building those new ones, you will find that only a few hundred out of an estimated 500,000 radio amateurs world wide are pioneering the way into the satellite era of amateur radio.

AMSAT is currently managing the day to day operation of the AMSAT-OSCAR 6 and 7 spacecraft. These satellites are in low altitude orbits and allow communications ranges of up to 5000 km or so without any skip zones. However, the band is open for only about 20 minutes or so, five or six time a day, when the satellite passes within range. Whilst satellite communication is indeed possible, it is somewhat more difficult than conventional communications using the hf bands, and, also, relatively little commercial equipment is available to users at this time. The AMSAT-PHASE III spacecraft will open the vhf bands for hours at a time. In use these bands will appear to be similar to the hf bands, in that they will open up for communications with stations to the east of the user, slowly change to include areas to the north and south and then open up to the west before closing down. There will however be a lot of overlap between these areas. Contacts will be possible with the whole of the northern hemisphere and much of the southern for hours at a time with no skip zones. No skip zones. Can you imagine what that will mean? Anyone in the northern hemisphere will be able to hear anyone else. Can you imagine a round table qso between stations in New York, Washington, Los Angeles, Miami, Tokyo, Paris, Tel Aviv and Moscow all able to hear each other at the same time. This is not possible using the hf bands. Nets, emergency traffic handling, educational demonstrations and plain cq calls will all assume a new dimension.

Historically AMSAT has worked to build operational, simple to use satellites and now our goal is within sight. Our space program has been international in the true co-operative spirit of amateur radio. Our first spacecraft was AUSTRALIS-OSCAR 5 built in Melbourne, Australia, by radio hams at Melbourne University. It was not a communication satellite but carried among other things a prototype command system which proved that radio amateurs could control the operation of satellites in outer space. AMSAT-OSCAR 6 built by Australian, German and American hams was the first long life amateur radio communications satellite. Designed for a one year lifetime it is now showing signs of old age after four and a half years of faithful service. AMSAT-OSCAR 7 built by American, Australian, Canadian and German hams is now approaching its three year operational design lifetime.

In order to keep interest in space communications active through until 1980 when the first AMSAT-PHASE III spacecraft is expected to become operational, AMSAT is stretching its resources and building one more low orbit satellite (known as AMSAT-OSCAR D until launch). AMSAT-OSCAR D is a joint effort of the Japanese

(Continued on Page 4)

AMSAT Association, Project Oscar, and the ARRL all working closely in co-operation with AMSAT. AMSAT-OSCAR D is presently scheduled for launch in late 1977 and is primarily intended for continuing support of the educational program. Once the spacecraft is launched and in orbit it will become AMSAT-OSCAR 8 and will be considered to be in the public domain so that anyone can use it for communications purposes. The ARRL will then become responsible for all the operations management aspects of the satellite. To ensure operation consistent with the design of the spacecraft, AMSAT will act as technical consultants for the operations management of AMSAT-OSCAR 8 during its active lifetime. The ARRL will also pay AMSAT the sum of $50,000 to partially reimburse AMSAT for the development and construction costs of the spacecraft. Space satellites are not cheap. AMSAT-OSCAR 7 cost in the neighborhood of $60,000, but a similar commercial communications spacecraft could have cost $2,000,000.

AMSAT also has a policy of not obsoleting equipment. AMSAT-OSCAR 6 carried a 145.9/29.5 MHz transponder. AMSAT-OSCAR 7 introduced a UHF/VHF transponder on 432/145.9 MHz. This transponder designated as MODE "B" (145.9/29.5 became MODE A) clearly demonstrates the superior capabilities of vhf for amateur satellite transponders. The Mode B link on AMSAT-OSCAR 7 is clearly superior to the Mode A links of AMSAT-OSCARS 6 and 7. AMSAT-OSCAR D will also carry a Mode A transponder and a new Mode J transponder (built in Japan) on 145.9/435.15 MHz. Similarly, the first of the AMSAT-PHASE III spacecraft will carry two transponders, utilizing Modes A and J. Thus, as amateurs become interested in satellite communications and obtain equipment, they can be sure that their investment will not become obsolete with the passing of any one spacecraft.

The AMSAT-PHASE III spacecraft will be accessible with full quieting ssb or cw signals by any amateur radio station using an output power of the order of 50 Watts and small rooftop tv style antennas. Thus, any apartment dweller with a balcony having some northern exposure will be able to work the world. In fact the performance of this equipment communicating through an AMSAT-PHASE III spacecraft will usually be superior to a KiloWatt-Quad combination on the hf bands.

Amateur spacecraft have long passed the days when launches were made available because the spacecraft were there, or to demonstrate that hams could do it too. There are now many spacecraft competing for all too few launch opportunities. AMSAT thus has to show how the piggy back launch can be implemented for a minimum of cost to the launching agency, and also show cause as to why a spacecraft should even be carried aloft in the first place. Thus the OSCAR series spacecraft have also been used for scientific and public service demonstrations of communications capabilities. There have been educational transmissions to introduce the space sciences to students in classrooms; demonstrations of an emergency crashed aircraft locating technique in Canada and the USA which has shown that it is possible to pin point the position of a simulated crash site to within a few miles of the exact location. NASA is now studying an operational satellite system to do just that, saving uncalculable numbers of lives and thousands of dollars in search and rescue costs. Data collection techniques using remote sensors relaying data via satellite to a central location have been demonstrated. Mobile terminals have been set up in cars, boats and private aircraft. Medical emergency traffic has been simulated. Electrocardiagraph data has been transmitted coast to coast; phone patches have linked Hawaii to the Mainland US; direct "broadcasting" experiments have taken place. Many of these activities are only being talked about by the professionals, or if they are being done, are being done at many times the cost, in terms of both the spacecraft and the ground equipment.

AMSAT-OSCAR's 6 and 7 have paved the way. They have shown that we can use the satellite bands and have some grasp of the potential that they have to offer, but impressive as these are, much is yet to come. Contacts via AMSAT-OSCAR's 6 and 7 require some technical expertise. The spacecraft must be tracked as they speed across the sky, passes last only about 20 minutes and ranges are limited. The AMSAT-PHASE III spacecraft will change that. Spacecraft qso's will become very simple to implement. Communications will be possible for hours at a time, but these capabilities will not come for free.

Hardware costs for the first AMSAT-PHASE III spacecraft are estimated as $200,000 (a government or commercial spacecraft providing similar performance would cost millions).

You can help the AMSAT-PHASE III program financially by sponsoring part of the satellite. You can sponsor any number of solar cells ($10 each), battery cells ($200 each), solar panels ($2,000 each), transponders ($5,000 each), an on-board microcomputer ($8,000) or a rocket motor ($10,000). All donations including the $100 life membership donations are tax deductable under section 170 of the IRS

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THE IMPORTANCE OF THE PROPOSED 64° ANGLE OF INCLINATION OF THE PHASE III SATELLITE ORBIT

BY K. J. DESKUR, K2ZRO

The paper by DL3SX in the December, 1976, issue of the AMSAT Newletter covered quite thoroughly the "mechanics" and calculations involved in tracking a satellite in an elliptical orbit. One item, however, received only a casual mention even though it has a very significant impact on the development of tracking calculators.

On the bottom of page 14 a mention is made regarding the drift of the perigee point "against the track" of the satellite. (In other words, the long axis of the ellipserotates slowly, with the center of the earth as a pivoting point). It is also mentioned that this slow drift, after a period of time of three years, will cause the apogee of the satellite to shift, from its original position over the North Pole to a point above the equator, as shown on Figure 1 (below).

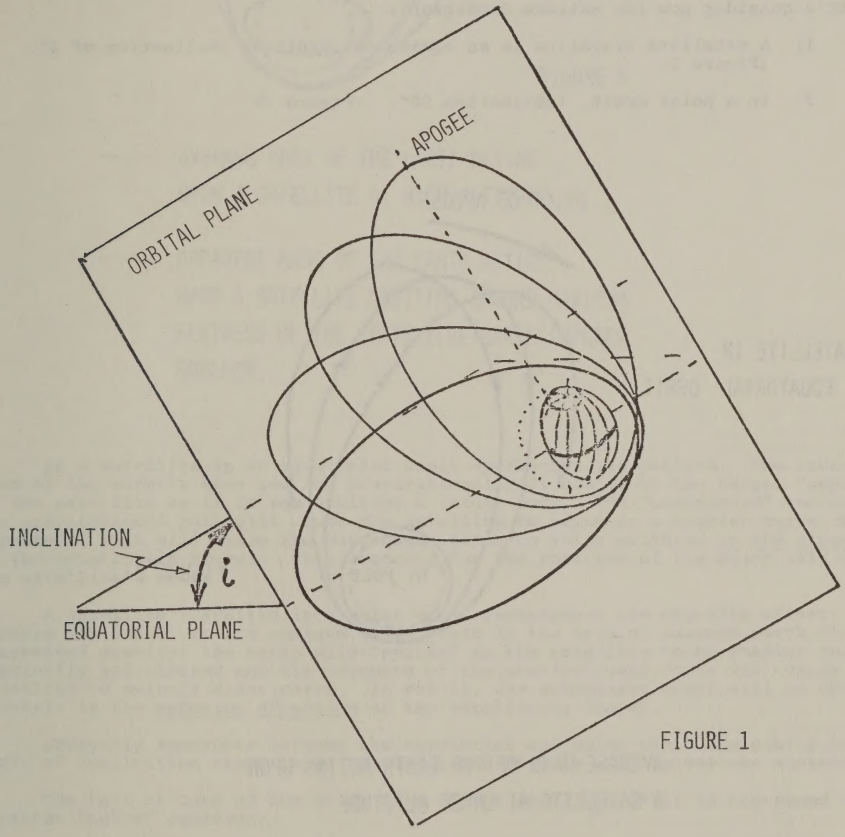

FIGURE 1

THE ORBIT MAY ROTATE IN ITS PLANE WITH GEOCENTER ACTING AS PIVOTING POINT. NOTE THAT THE ANGLE OF INCLINATION WILL REMAIN CONSTANT.

(Continued on Page 6)

Such a drifting apogee causes all kinds of grief to the designers of tracking calculators, because it requires periodical recalculations and redrawing of the shape of the earth track and relocation of the time marks upon it. This is, to say the least, a great nuisance and may be a discouraging factor for many prospective satellite users.

Fortunately someone, in his great wisdom, decided to shoot Phase III into orbit with an inclination of approximately 64°. This will make all of us who design tracking systems eternally grateful. Why? Let me present a somewhat oversimplified picture of what is involved.

The effect of the rotation of the major axis in an elliptical satellite track (also called perturbation) is caused by a 19 mile equatorial bulge of the earth at the equator. For a satellite traveling in a highly elliptical orbit, most of its journey takes place far away from the earth. From a large distance the gravitational irregularities of the earth appear "smoothed out" and the earth acts, gravitation wise, as a fairly perfect sphere.

But as the satellite approaches its perigee, the gravitational bulges will have an effect on the orbit of the space craft.

Let's consider now two extreme conditions:

1) A satellite traveling in an equatorial orbit or inclination of 0°. (Figure 2)

2) In a polar orbit, inclination 90°. (Figure 3)

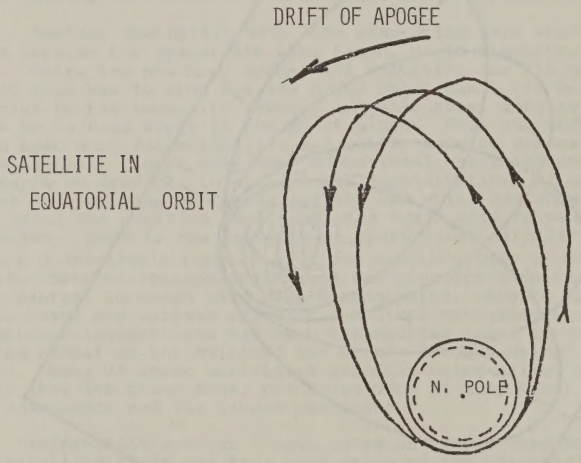

FIGURE 2

----- AVERAGE MASS OF THE EARTH ACTING UPON A SATELLITE AT LARGE ALTITUDE

——— APPARENT MASS OF THE EARTH ACTING UPON A SATELLITE ORBITING CLOSE TO THE EQUATOR (EARTH MASS APPEARS LARGER)

DRIFT OF APOGEE

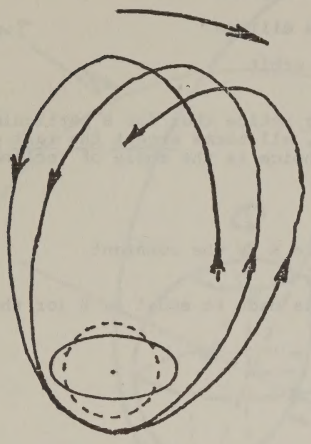

FIGURE 3

----- AVERAGE MASS OF THE EARTH ACTING UPON A SATELLITE AT HIGH ALTITUDE

——— APPARENT MASS OF THE EARTH ACTING UPON A SATELLITE ORBITING AROUND MAXIMUM FLATNESS OF THE EARTH (THE EARTH APPEARS SMALLER)

As a satellite in an equatorial orbit approaches its perigee, the concentration of the earth's mass and its gravitational pull caused by the bulge, "appears" to the satellite as if it was orbiting a larger body. The "unexpected" increase of the gravitational pull will cause the satellite to swing in a tighter curve than expected. This will cause the subsequent orbit to swing slightly in the direction of the satellite's travel. This accounts for the rotation of the major axis of the satellite's orbit.

A satellite traveling in a polar orbit experiences the opposite effect. Because its travel at its perigee takes place in the area of maximum earth flatness, (decreased gravity) the earth will "appear" to the satellite to be smaller than originally anticipated and the decrease of the gravitational force will cause the satellite to swing a wider curve. In result, the subsequent orbit will be shifted slightly in the opposite direction of the satellite's travel.

Obviously somewhere between the equatorial and polar orbit there will be an angle of inclination where those two described effects will cancel one another.

The rate of turn of the major axis of the satellite orbit is expressed by a rather "hairy" equation:

$$(1) \quad \beta = 1/2\ j\ (g/R)^{1/2} (R/a)^{7/2} (1-e^2)^{-2} (5\cos^2 i - 1)$$

where j = constant for equatorial bulge

g = 32.12 ft/sec/sec

(Continued on Page 8)

R = radius of the earth

Q = major axis of the elliptical orbit

e = excentricity of the ellipse

i = inclination of the orbit

Examining the equation, we may notice that for a particular orbit with a defined major axis and excentricity, all terms except the last one are constants and beyond our control. The only choice is the angle of inclination.

Simplifying the equation:

(2) $\beta = K(5 \cos^2 i - 1)$ where K is the constant.

Now, if the term $(5 \cos^2 i - 1)$ is made to equal 0, β (or the rate of rotation) will also be 0 or nonexistent.

Well, let's do it:

$$5 \cos^2 i - 1 = 0$$

$$\text{i.e. } 5 \cos^2 i = 1$$

$$\cos^2 i = .2$$

$$\cos i = \sqrt{.2}$$

$$i = \arccos \sqrt{.2}$$

$$i = 63.43°$$

This is the intended inclination of Phase III!

Satellites shot into the so called, "63° slot", (very much favored by the Russians for this very reason), have stationary (nonrotating) elliptical orbits and their apogees are fixed permanently over a particular earth latitude. This makes their tracking no more difficult than those of OSCAR 6 and 7.

With the proposed "argument of perigee" of 270° the apogee will be fixed at the latitude equal to the angle of inclination; in other words, in a position closest to the North Pole. (see Figure 4)

Now, how does all this affect tracking:

With the orbital parameter described above, the subsatellite track superimposed on the northern projection of the earth will look similar to that shown on page 7 of the December, 1976, Newsletter and will remain constant for the life of the space craft.

If the track is drawn on a transparent material, it only needs to be rotated (North Pole being the pivoting point) to the published equatorial crossing position on the equator, in exactly the same manner as the track of the "Satellabe" or OSCARLOCATOR is. The time marks on the track will remain permanent, because the orbital ellipse will be in a fixed position in respect to the earth.

The altitude of the satellite in an elliptical orbit is changing continuously. Therefore, if elevation information is required for tracking purposes, the instantaneous altitude of the space craft must be known at all times.

The convenient property of the "63° slot" is the fact that as the subsatellite points cross various earth latitudes, the altitudes (although different for each latitude) will remain constant for the life of the satellite. In other words, the satellite crossing of a particular latitude will always be related to the same altitude.

This convenient arrangement will allow us to calculate and devise permanent azimuth/elevation overlays (to be centered on the user's QTH) identical in application (although somewhat different in shape) to overlays presently used with the "Satellabe".

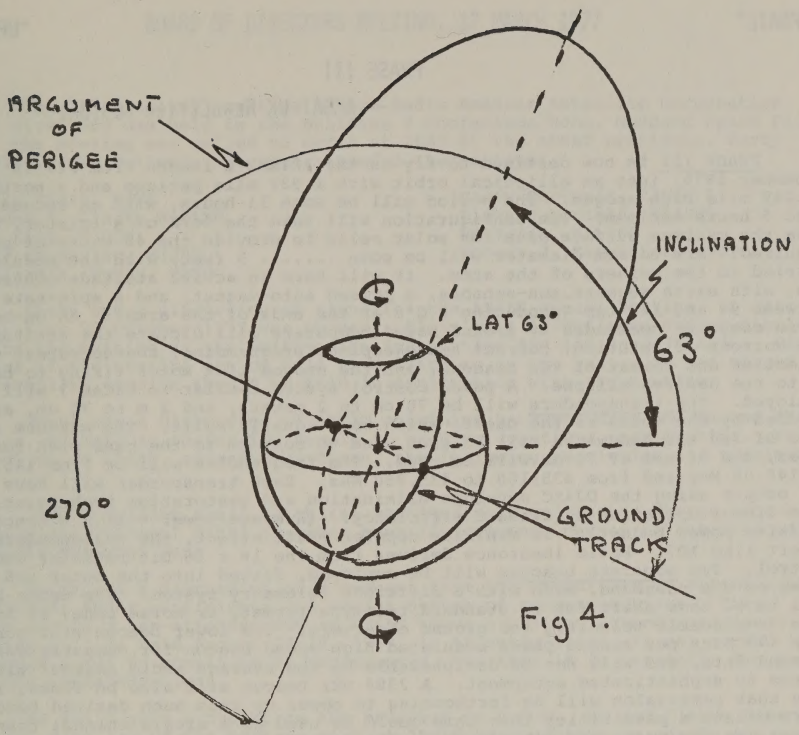

Fig 4.

A Satellabe-type calculator suitable for Phase III is presently being developed by yours truly. As soon as the exact orbital parameter of Phase III become known and verified, final correcting calculations will be made and an article describing the construction of the tracking device will be published.

At any rate, readers should not be disturbed by the apparent complexity of tracking a satellite in an elliptical orbit. The "63° slot" simplifies the matter to a point that tracking Phase III will be as simple as tracking OSCAR 6 and 7.

-K2ZRO-

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100.00 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS:

LM-591 Robert W. Barbee, Jr., W4AMI
LM-592 Robert B. Geddes, G8GGI
LM-593 Earl W. Tonjes, W4NG
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LMS-23 Montreal Amateur Radio Club, Inc., Montreal, Quebec, Canada (VE2ARC)
LMS-24 The Heath Company, Benton Harbor, Michigan

PHASE III

-- AMSAT-UK Newsletter (G3IOR)

PHASE III is now destined to fly on the ARIANE 2 launch from FY7 in December 1979, into an elliptical orbit with a 932 mile perigee and a northerly 24,249 mile high apogee. The period will be some 11 hours, with an apogee of 4 to 5 hours minimum. The configuration will take the form of a tristar, to give the maximum surface area for solar cells to provide the 40 watts of power required. Arm to arm diameter will be some ..... 5 feet, with the modules carried in the corners of the arms. It will have an active attitude control system, with earth sensors, sun-sensors, a pulsed auto-magnet, and a spin-rate of between 90 and 120 rpm (producing 6 G's at the ends of the arms). An on-board micro computer commanded by ground based computers will dictate the attitude for the correct orientation, correct housekeeping, programming, charge-rates, modes, selection and format of the beacons, and the apogee kick motor firing to bring it to the desired ellipse. A power control system similar to OSCAR 7 will be employed. The transponders will be 70 cm to 2 meters, and 2 m to 70 cm, as decided by the votes of the users, which were equally split. The maximum allocation of 150 kHz bandwidth will be used, and to conform to the band plan for satellites, the hf end of 70 cm will be used. The frequencies will be from 145.850 to 146.00 MHz and from 435.100 to 435.250 MHz. Each transponder will have 50 W pep output using the DJ4ZC envelope elimination and restoration techniques, to give linear operation at Class C efficiency. (Average power = 12.5 W hence a positive power budget). To minimize doppler shift effect, the transponders will invert like AO7. Basic insurance derives from the 16 x 16 bit register computer control. Two separate beacons will be employed, fitted into the outer and inner edges of the passband, each with a different telemetry system. The upper beacon will be 50 baud shift fsk in standard teletype format, or morse code, or ASCII to give de-codeable telemetry for ground observers. The lower beacon will consist of a 400 bits per second phase modulated high speed beacon for computer control command data, and will not be decipherable by the average radio amateur without access to sophisticated equipment. A 2304 MHz beacon will also be flown, in the hope that permission will be forthcoming to power up this much desired beacon. There exists a possibility that this could be used as a single channel transceive system, as few users are anticipated. The command link will also employ two means as the normal 400 bits per second will be supplemented by a computer scan emphasis system that will function even when the signal is 20 dB below the noise, so that control may be manifested by a simple hand held command transmitter. The antenna will take the form of a quadrifiliar, like that currently used on OSCAR 7 for the 2304 MHz beacon, but scaled up to 145/435 MHz. Unlike AO-7's canted turnstile, which is only linear circular off the axis, the quadrifil will give true circular polarization with exactly the right mushroom pattern needed with smooth lobes to give some 10 dB of gain. The orbit would commence as the de-circularized 900 mile perigee, 2000 mile apogee, and help to give some early experience of elliptical tracking, to give an earth arc of some 105° for coverage. Using energy gained over the pole, the apogee kick motor would be fired when the spacecraft is in the correct orientation attitude and at the right point, to push the orbit to the 24,249 mile apogee over the North Pole. It would zoom over the South pole not unlike AO6 and 7 at about the same height, then climb to the maximum Northerly point to stay there for up to five hours, before gaining velocity to the South again. The orbit would drift some 1° per day, taking 40 - 90 days for a transfer orbit. When finally in situ, the earth arc will be better than 140° covering all the Northern Hemisphere at one go, and even "seeing up to 45° south." It will be slightly off the pole initially, then progress after about 1.5 years to the other side of the pole, then, after three years, it will be over the equator, over the other side of the equator after six years, then back over the North Pole again after 7.5 years, and so on, so all will get a chance, as the minimum life time will be five years, but conceivably 200! Tracking seems fraught with difficulty at first sight, as OSCAR will rise to the North, slowing down, and whilst it is at the high point, earth will do the better part of half a turn, making the track look like a top cramped figure "8", gnetly shifting each time. In practive, it is unlikely to do anything beyond the limits of your 3 dB points, other than when it is rising or setting; all one needs to do is to follow it North by checking the beason(s) and gently elevate occasionally as it rises. AMSAT will be producing kits to manufacture a tracker-computer for those who do not wish to wrestle with three dimensional plotting. The doppler shift will tell you when it has started to move rapidly, hence when you have to start to consider turning your beam in azimuth. You are advised to have circularly polarized antennae with as-el on a common heading for maximum advantage. The

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BOARD OF DIRECTORS MEETING, 17 MARCH 1977

The 17 March 1977 meeting of the Radio Amateur Satellite Corporation board of directors was held in the Building 2 Conference Room, Goddard Space Flight Center. The meeting was called to order at 2045 by the AMSAT president, Perry Klein, W3PK. The following persons attended the meeting:

Perry Klein, W3PK
Thomas A. Clark, WA3LND
Jan King, W3GEY
Charles Dorian, W3JPT
William A. Tynan, W3XO
Marty Davidoff, K2UBC/3
Richard Daniels, WA4DGU
Ed Kalin, WA1JZC
Robert J. Carpenter, W30TC

There was a discussion of plans for the AMSAT Annual Meeting. A date of either 8 or 22 October 1977 was chosen. Klein will investigate the possibility of holding the meeting at the Smithsonian Institution Air and Space Museum. Clark will check if the meeting can be held at Goddard as in the past. It was agreed that a technical session should be held in conjunction with the meeting.

There was a discussion of AMSAT obtaining BankAmericard and Master Charge facilities, to make it easier for people to send us donations, memberships, etc. On the motion of Clark, seconded by Tynan, the following resolution was unanimously passed:

"The President shall establish BankAmericard and Master Charge accounts at the Virginia National Bank, or other bank if agreement cannot be achieved with the Virginia National Bank."

There was a discussion of a request from the organizers of Personal Computing 77 that AMSAT participate and send a number of representatives. They intend to donate a per-attendee sum to AMSAT above a minimum attendance figure. The meeting will be held August 28-29, 1977, in Atlantic City. It was agreed that AMSAT should agree to commit to be represented, but that it is presently too early to name the representatives.

Ed Kalin gave a report on the progress on A-O-D. He and Clarke Greene, WA1JLD, are detailed by the ARRL to work at AMSAT headquarters to ensure the timely completion of A-O-D, the Oscar 6 replacement satellite. There is substantial progress on the electronics tasks, but there is still a lot of work remaining on the mechanical tasks. Tom Clark noted that the work was still being done in our "less-than-basement" mode and wondered if this was holding up progress. Daniels, who is doing some of the work, felt this to be unquestionably so.

King gave a report on the progress on Phase III. We now have two potential missions for Phase III, Ariane - which is approved - and the SSUS-A on the Shuttle - for which AMSAT has made a request. They are both scheduled for December 1979. It is proposed that at least two spacecraft be built.

Phase III progress items are:

1. Clark has written an antenna modeling program useful for the spacecraft antenna design.

2. A European manufacturer has agreed to partially donate one set of solar arrays, however, the proposed cells would not fully meet our requirements and the AMSAT contribution toward the cost would be in the $8,000 to $10,000 range. In view of our plans to build at least two spacecraft, other sources are to be investigated.

3. The 70 cm to 2 m transponder exists in breadboard form.

4. King has formed a Ground Support Committee to plan the ground station portion of Phase III. He has appointed VE3SAT, WØMJS, WØLER, and W5SXD.

5. Davidoff and others are working on orbit prediction techniques for Phase III.

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ANNOUNCEMENT OF AMSAT ANNUAL MEETING

The ninth AMSAT Annual Meeting will be held at 8:00 P.M. on Saturday, October 23, 1977, at the NASA Goddard Space Flight Center Employee Recreation Center in Greenbelt, Maryland.

In accordance with the AMSAT Bylaws, ballots for the election of three Directors and two alternate Directors will be counted at this meeting. The terms of the following Directors will be expiring as of this meeting: Charles Dorian, W3JPT; Jan King, W3GEY; Perry Klein, W3PK; and William Tynan, W3XO/W3KMV.

The agenda, in addition to the election and regular business, will include:

AMSAT Annual Report

AMSAT-OSCAR-D Project

AMSAT Phase III Progress Report

AMSAT-OSCAR 6 and 7 Operations

Results of election of Directors

As we did last year, there will be an AMSAT Technical Symposium on OSCAR satellites, beginning at 3:00 P.M.

For those coming from out of town, let us know, and we will arrange for you to be hosted by Washington area AMSAT members.

DIRECTIONS TO THE NASA GODDARD EMPLOYEE RECREATION CENTER:

Take the Baltimore-Washington Parkway to the Greenbelt Road exit (Rt. 193), and take Greenbelt Road east 1.5 miles to Soil Conservation Road (on the left). Turn left onto Soil Conservation Road and go 0.1 mile to the first open gate you come to on the right. Go through this gate, continue onto the gravel road and then on to the wooden Goddard Recreation Center building.

There will be an AMSAT dinner before the meeting at 6:00 P.M. at the Goddard Employee Recreation Center. Please let us know if you can join us so that we can firm up reservations.

The 146.25/85 AMSAT repeater will be available for talk-in before the dinner and the meeting.

PERSONAL COMPUTING 77

Personal Computing 77 will be two full days of seminars, major exhibits and demonstrations in home and personal computers to be held 27 and 28 August in Atlantic City, NJ. Last year over 4,000 computer hobbyists and radio amateurs enjoyed Personal Computing 76. This year, Personal Computing 77 hopes to be able to sponsor a part of the microprocessor module to be included in the Phase III satellite that the Radio Amateur Satellite Corporation (AMSAT) is building for launch in 1979. By attending Personal Computing 77, you will help this organization extend its support to AMSAT, and you will see many radio and computer exhibits. For a free TRIP-KIT, write PC 77, Route 1, Box 242, Mays Landing, New Jersey 08390.

AMSAT will be one of the radio organizations with a booth at PC 77 for the two day exposition. If you as an AMSAT member could spend an hour at our booth explaining amateur radio to computer hobbyists, it would be very helpful. If you desire to help at the booth or give a seminar, please drop a QSL to W3HUC, 7925 Nottingham Way, Ellicott City, MD 21043.

"LETTERS AND COMMENTS"

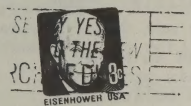
Dear Sir,

My membership in AMSAT expired in December, 1976. In reading the AMSAT Newletter which was current at that time, I saw that the cost of that newsletter represented over half the membership dues. With all due respect to those who produce it, I really get little from the Newsletter.

I am therefore, sending along my check for $5,00 as a donation to the work of the group. I do not expect to receive membership for it and perhaps you can save some of that Newsletter cost by not having to send one to me.

You and the Board might take a hard look at the content and usefulness of that publication to the membership at large and determine how much of the information it deseminates is also available to your members from other publications. There might just be a large savings in printing and postage by reducing or eliminating the Newsletter.

Good luck to the entire group in your coming endeavors.



73,

Thomas M. Gooding
K4LHB

(The Newsletter contains submitted material. It can only publish that which is available Does anybody else agree with Thom, does anybody disagree? Please let me know. ...Joe)

Dear Joe,

AMSAT lost a good friend and helper with the recent passing of Mr. William A. Kotras, K9HUI, of Kokomo. Bill had helped with several design projects for the CODESTORE ground equipment used by Randy, VE3SAT. Bill had also co-authored one of the AMSAT package of articles in July, 1975, 73 Magazine entitled "OSCAR RTTY Converter."

Bill will be long remembered as a fine engineer and a real gentleman.

K. O. Lerner II
K9PVW
AMSAT Area Coordinator -- Indiana

Dear Perry,

I am enclosing a check for $20.00 to sponsor two solar cells for our upcoming new satellite. I am particularly proud to be a member of such a fine organization, and am pleased to be able to assist in the technological advancement of this facet of amateur radio. Under your guidance as President, it has continued to maintain the aura of a truly professional organization. Congratulations, and I impatiently await launching of the next vehicle by which to establish two-way communication.

73,

Stan Brigham
W3TFA

Gentlemen:

Enclosed is my personal check for $100.00 to pay for 10 solar cells for the new satellites. Hope they are good ones and do a good job of keeping the batteries up. A case of paying cash for something that charges!

Hope that everything goes well with assembly and testing of the next satellite. Will have to get a 435 MHz converter to take advantage of both modes. Good luck and 73,

Sincerely,

Richard J. Cotton
W8DX

Dear Sir,

This is my first letter enclosed with the "Summary Sheet for TWO-WAY Satellite Contacts".

One month ago, one minute before my first QSO via OSCAR 7, I was not sure that I could do it. I simply couldn't believe that my equipment, a YAESU FT-221R, running about 7 watts output on 2 meters (considering cable losses) and only a ground plane GPG-2 by HY-GAIN was good enough for this powerful achievement. With me was PY1CK, Flavio, who is responsible for my start in working OSCAR. He

(Continued on Page 14)

told me that I could be sure that I'd make your first QSO via the satellite. PY2SU, Humberto, told me the same in a kind letter; and they were right. I made my first and second QSO. Two countries and two continents in the first day was really an auspicious beginning. Now, after one month and already 20 QSOs in eight countries (7 CW and 5 SSB), I even invite friends over for a QSO via OSCAR. Last Saturday PY1BJ came. We made a QSO using SSB, and he also promised to join AMSAT. It was his first OSCAR QSO. If anyone would like to make a schedule, please let me know.

That's all for now.

73,

Gerson Rissim, PY7APS/1
PO Box 12178, ZC-07
20000 Rio de Janeiro, RJ.
BRAZIL

Dear Joe,

On 18 January 1977 during Orbit 9953(B) Lee Wical, KH6BZF, and I climaxed our mutual 10 month effort by completing what we believe to be the first two-way QSO between Washington, DC and Hawaii via OSCAR. As is generally known to readers of the Newsletter, OSCAR operation between Hawaii and the East Coast is only possible for very brief intervals on optimum orbits, e.g., Lee and I have been working with about a one-minute window every 36 days on OSCAR-7 (B), but 2x-QSOs are possible, perhaps even as far north as N.J. or N.Y.

I would like to thank those OSCAR enthusiasts who provided good wishes for our success during the past year and especially to thank Keith Mason, W9OII, who was a constant source of encouragement: not only did Keith tape many of our attempts, but he also predicted a non-trivial discrepancy between the calculated and actual position of OSCAR-7 during November and December, 1976. Keith's "dead reckoning" estimates are not to be taken lightly; a comparison of the 01 January 1977 predictions from the 1976 and 1977 Orbital Prediction booklets shows OSCAR-7 to be a.40° further west and 50 sec. later in 1977 as compared to the 1976 predictions.

Finally, I would like to mention that Lee is a great guy to work with and that he has indicated a willingness to "fire up" his station for anyone looking for KH6-land on OSCAR. Contact Lee directly for sked info: 45-601 Luluku Rd., Kane'ohe, HI 96744.

73 and CU on OSCAR,

Earl, WA3THD

Dear Joe,

Many thanks to all of those who helped to make the AMSAT booth at the Dayton Hamvention a huge success this year. Dick, WA8YFW, (Ohio Area Coordinator) arranged for our booth space and tables. Many supplies were brought out from Washington by Art, W4ART. A terrific group of AMSAT members was on hand to help with the booth during the two solid days of the show.

Also, thanks to each of the speakers on the SPACE COMMUNICATIONS Forum this year. Dr. Tom Clark, WA3LND, described the upcoming AMSAT-OSCAR communication satellites and Dr. Will Webster, WB2TNC, compared operations of A-O-D with the VHF transponder aboard the LANDSAT series of spacecraft. Tom Prewitt, W9IJ, described and demonstrated his programmable pocket calculator program for antenna headings in "real-time". To add a little spice to the Forum Tom Clark discussed our efforts to search for radio signals from other intelligent beings in nearby space in a talk entitled, "The Ultimate QSO."

Dick, W8DX, received an AMSAT Special OSCAR award for his untiring efforts in telemetry data collection, helping of newcomers and general utilization of the OSCARs. W8DX is Area Coordinator for Michigan.

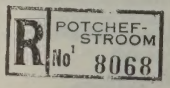
Bert, VE3DPB, brought the A-O-D attach ring he had fabricated so well and presented it to Tom, WA3LND, AMSAT Executive Vice-President.

Excellent models for both A-O-6 and A-O-7 were exhibited at the booth by Ed, W3BWU. Ed also brought a large assortment of DX QSLs which were augmentated by Certificates and QSLs sent by Keith, W9OII. Special thanks to all those who helped out in the booth, namely WA3LND, WB2TNC, W3BWU, WA8YFW, W4ART, W8DX, VE3DPB, and WA3DPN, Walt.

Old friends Floyd, W4GSH, and Stan, K8MYN, were on hand but are convalescing.

73,

K.O. Learner II
K9PVW



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Code. All sponsors will receive a certificate suitable for framing acknowledging their contribution. A plaque honoring for posterity contributors of $1,000 or more will be carried on the spacecraft in orbit around the Earth; contributors will receive a replica of the plaque as a momento.

If you are willing to contribute time or money and would like to get involved in bringing a new era to amateur radio, join AMSAT's active team. For further information about all aspects of AMSAT and the ongoing amateur radio satellite communications program, write to me, Joe Kasser G3ZCZ/W3, at AMSAT, Box 27, Washington, DC, 20044.

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After a short discussion, an OSCAR Century Award was authorized.

There was a discussion of the fund-raising program, conducted by Clark.

Clark gave estimates of the costs and returns from various aspects of the fund-raising program. George Perrine, W9KOI, is generating advertising material for the solar-cell sponsorship program. Larry Papke, WB5MPU, is preparing certificates for this promotion.

On the motion of Tynan, the Board authorized an expenditure of no more than $3,000 for costs in running the Solar Cell donation project.

Tom Clark was appointed to head the entire fund-raising activity.

Clark reported on a tape letter received from Pat Gowen.

There was considerable discussion on obtaining more suitable quarters for the hardware work now going on in Klein's apartment and Daniels' basement. Klein put forth a plan whereby AMSAT could rent an apartment ajacent to his. Others worried about industrial use of the apartment and the problems of getting the large spacecraft out the window and to the ground. There was a discussion of rental of warehouse-type facilities in an industrial park. King will look into this.

The meeting adjourned at 0020, 18 March 1977.

Respectfully submitted,

Robert J. Carpenter, W3OTC
Secretary

(Continued from Page 10)

sharpness of your beam will not have the disadvantage it has now in tracking, as the rate of movement will be very slow other than at the horizons. Your existing mode 'A' and 'B' tx will serve you well, as only 100 W erp maximum should be necessary, as the 10 dB quadrofil gain plus the famous DJ4ZC sensitivity will ensure this.

DX-Potential will be enormous, as this will be the first time that radio amateurs will be able to qso all W, JA, Eu, and the North Pacific, indeed all the Northerm Hemisphere and down to 45° South at the same time, but, note that this will all be in 150 kHz! Imagine 14 MHz without any skip differential or selection ...unles we all carefully practice our bandplan and power limitations, it could be made untenable. It is up to the users themselves to establish operational ethics right now so that the incredible possibilities of Phase III can be fullfilled. Your ideas are requested. Write to G3ZCZ, c/o AMSAT.

The article "Cost-Performance Criteria for Evaluating Phase III Satellites" in the March issue assumed a transponder bandwidth of 100 kHz. Since the transponder on the first Phase III satellite will probably have a bandwidth of 150 kHz the conclusions are even more favorable than those quoted: (1) the figure specifying the maximum number of users equipped for the uplink frequency which the first Phase III satellite can accommodate should be increased to 30,000; (2) the figures specifying the yearly cost per user should be scaled downwards.

AREA CO-ORDINATOR UPDATE (USA)

The following correction should be made to the list published in the March Newsletter.

Delaware	Mr. A. Earl Henson, W3ZNF, RD 2, Box 208, Camden, Del. 19934 (302) 697-6267.
Idaho	Mr. Ronnie E. Moss, K7ENE, Route 3, Box 400, Rexburg, Idaho 83440 (208) 356-2359.
New York	Mr. Jay Buscemi, K20VS, 8 Wesford Court, St. James, Long Island, NY 11780, (516) 584-7951.
Oregon	Mr. Dave Leonard, WA7VKC, 1980 Hillcrest, West Linn, OR 97068, (503) 636-2379.
Pennsylvania	Mr. E. F. (Buck) Ruperto, W3KH, RD 1, Box 166, West Alexander, PA 15376 (412)663-5004.
	Delete K3SWZ.
South Dakota	Mr. Stan Burghart, WØIT, P. O. Box 73, Watertown, SD 57201.
Washington	Delete K7VNU
Wyoming	Mr. Paul Humberson, WA7DKZ, 508 Clark, Laramie, Wyoming 82070.
Maine	Mr. Jon Neary, W1UA, Starr Acres Maplewood, Maine 04052, (207) 793-8075.

OVERSEAS COUNTRY CO-ORDINATORS UPDATE

France	G. Francon, F6BEG, 2 Rue Du Quercy, 1500 Aurillac, France.
India	V. Subramanian, VU2UV, 159/1 Silver Oak Avenue, Hq. Trg. Command, IAF, Hebbel-Bangalore, 560006, India.

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